Sept. 10, 1963 J. MARTIN 3,103,042

STRUCTURAL BUILDING ELEMENT

Filed Sept. 28, 1959 2 Sheets-Sheet 1

Fig. 2

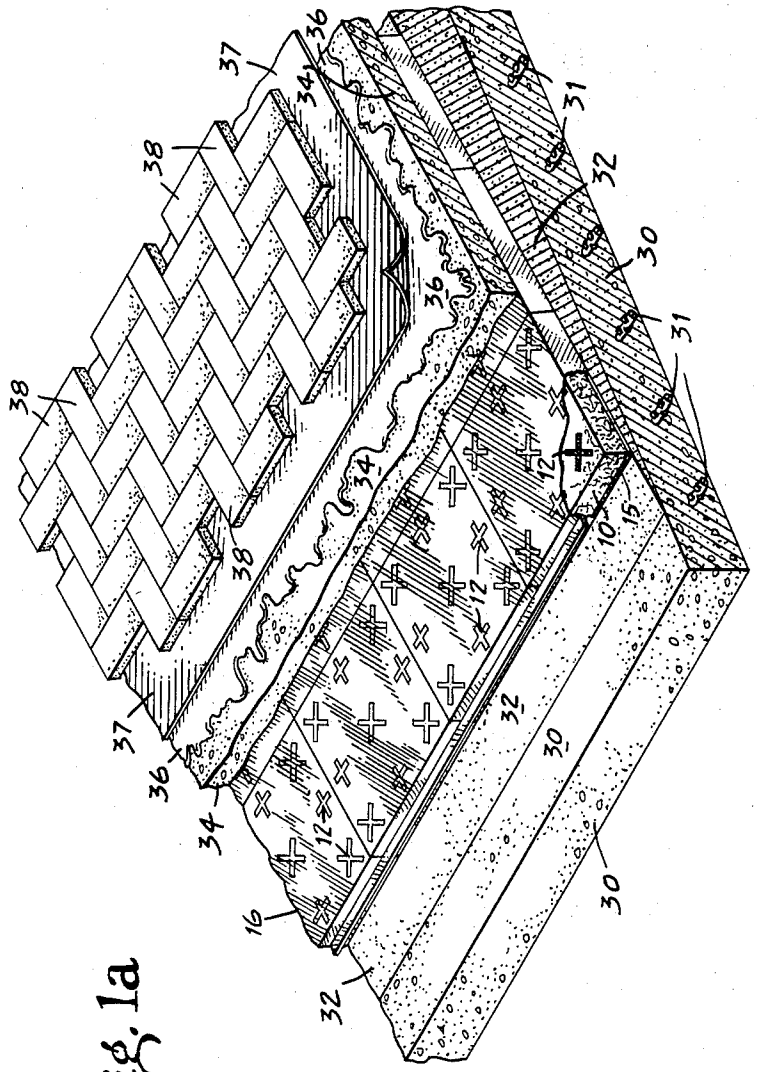
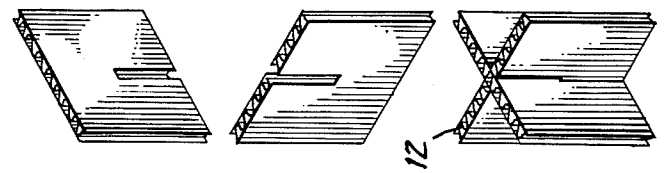


Fig. 1a



INVENTOR.
John Martin,

BY Kenyon and Palmer

ATTORNEYS

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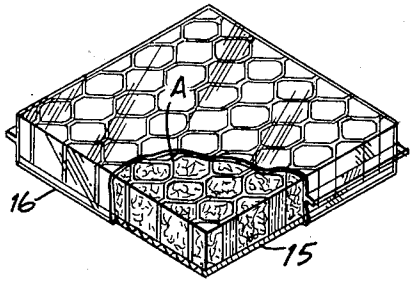


Fig. 3

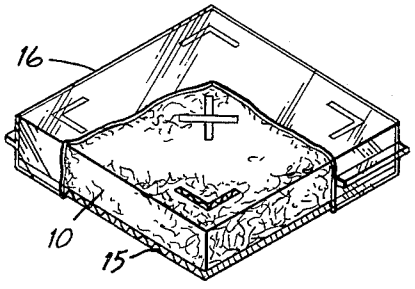


Fig. 4

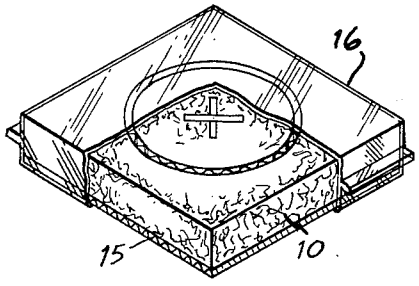


Fig. 5

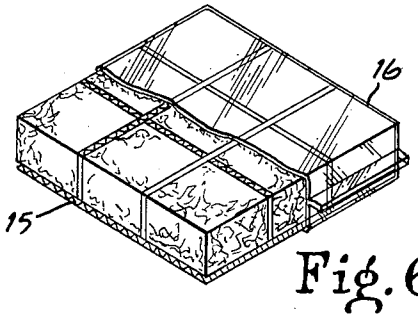


Fig. 6

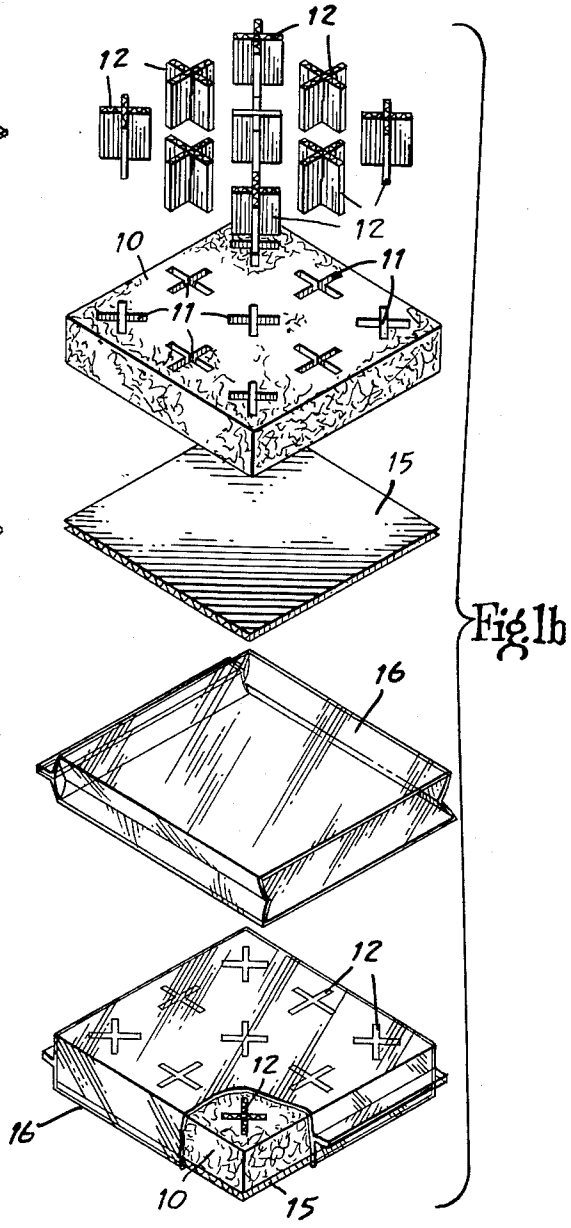


Fig. 1b

INVENTOR
John Martin,

BY Kemon and Palmer

ATTORNEYS

United States Patent Office 3,103,042 Patented Sept. 10, 1963

3,103,042

STRUCTURAL BUILDING ELEMENT

John Martin, Monterrey, Nuevo Leon, Mexico, assignor to Fabricacion de Maquinas, S.A., Monterrey, Nuevo Leon, Mexico, a corporation of Mexico

Filed Sept. 28, 1959, Ser. No. 842,820
1 Claim. (Cl. 20—15)

This invention relates to thermal insulation members and more particularly to thermal insulation members which have load supporting characteristics and which can therefore be classified as construction elements. While this development was originally designed for use in a particular type of roof construction which is widely used in other countries, notably Mexico, it should have a wide field of application wherever its unique combined properties of thermal insulation and load bearing would be useful.

In any form of thermal insulation, it is always a problem to construct a member such that its insulating properties are not destroyed with age or by the absorption of moisture, dust, dirt and the like. It is likewise a problem to provide a form of insulation which is easily shipped and handled without the likelihood of destruction of its useful properties.

Accordingly, it is the principal object of the present invention to provide a readily usable and inexpensively produced unitized form of load supporting and thermal insulating material. A further object of the present invention is to provide a fluid tight thermal insulating construction element with substantial permanent load bearing properties. Other objects will be apparent from the following description when read in conjunction with the attached sheets of drawings in which FIGS. 1A and 1B show a preferred embodiment of the construction element; and FIG. 2 is a perspective view with parts broken away of a typical roof structure of the type for which the construction element of the present invention was designed; and FIGS. 3, 4, 5 and 6 show alternative embodiments.

In general, the foregoing objects of the present invention are achieved by structurally reinforcing a bat of thermal insulating material and heat sealing the entire structure within a tight fitting plastic fluid tight cover. The specific form and arrangement of reinforcing elements and their distribution within the insulating bat is of particular interest.

Referring now specifically to FIGS. 1A and 1B of the drawings, a preferred embodiment will be described. The thermal insulating material is indicated at **10**. This material is first formed into a bat having a pair of substantially parallel, opposed, planar surfaces and preferably, is in the shape of a rectangular parallelepiped, as shown. The next step in the assembly of the element is to form a plurality of X-shaped cuts or apertures in the insulating bat. Such apertures are indicaated in the drawing by the reference numeral **11**. It will be noted that the orientation of the X-shaped cuts with respect to the bat is different from each adjacent cut. Next, a plurality of X-shaped reinforcing members **12** are formed in the manner indicated in FIG. 1A. One of these reinforcing members is then inserted into each of the correspondingly shaped cuts in the insulating bat. The thus reinforced bat is then placed on top of a sheet of corrugated cardboard or the like, indicated at **15** and the entire structure is placed within the open end of a plastic bag **16**, shown in FIG. 1B. The open end of the bag is then heat sealed to form the completed element.

Turning now to FIG. 2 of the drawings, a typical roof structure for which the present invention was originally conceived is shown. A concrete roof slab **30** is first

poured in a conventional manner around reinforcing rods **31**. On top of the slab **30**, a wedge-shaped pile or layer of sand or earth is arranged as shown at **32**. The builder will then place a plurality of the insulating construction elements previously described on top of the sand or earth layer. The insulating members are laid to completely cover the earth or sand layer and are arranged in side by side relation as indicated in this figure. The next step in the construction of the roof is to place a simple board form or mold around the outer periphery of the assemblage of the insulating elements, and a second concrete slab **34** is poured in this form. Usually, once the upper slab has set, it is covered with a layer of asphalt or the like as indicated at **36** in this figure. Also conventionally, a layer of roofing paper or the like **37** is then laid on top of the asphalt coating on the upper slab. The entire upper surface is then covered with tile or brick blocks **38**.

It will be obvious, that in this type of structure the insulating members in order to be effective must be able to maintain their original form and thickness permanently, and under the rather severe conditions of loading imposed by a roof structure of this type. Unfortunately, the greater the structural strength of the insulating members, the less insulating properties they have. To go to one extreme, if the X-shaped reinforcing members as described with reference to FIG. 1 were made of metal or other highly heat conductive material, the effectiveness of the insulation would be substantially destroyed. If corrugated cardboard or the like could be used and would furnish sufficient strength for this purpose, the insulation effectiveness would remain substantially unimpaired. Here again, and unfortunately, corrugated cardboard does not have sufficient strength for use in this type of structure. Under actual tests, it was found, however, that corrugated cardboard would support a load of this type for a short period of time, for example say about one week. After that time, however, the cardboard would begin to buckle and the insulating material would therefore be compressed and its effectiveness as a thermal insulator would be diminished. Accordingly, an ideal arrangement was found to be one in which the center X-shaped reinforcing member was formed of a material stronger than the surrounding X-shaped members. The ultimate design which was reached utilizes corrugated cardboard for the peripheral X-shaped supporting members and for the center supporting member a material selected from the group consisting of wood, pressed board, plywood, or reinforced synthetic organic material. Other materials will be apparent to those skilled in the art. The use of cardboard for most of the reinforcing members resulted in a minimum diminishment of the insulating properties of the element and also furnished sufficient support to hold the entire element in shape at least during the period in which the upper concrete slab was in the process of setting. After that time, the fact that these members would have a tendency to buckle slightly is overcome by the presence of the central reinforcing element of stronger material.

There are a number of form sustaining materials which are entirely practical and useful for the insulating bat. A suggested material could be selected, for example, from the group consisting of mineral fiber, organic fiber, mineral foam, and synthetic organic foam. Specifically, asbestos fiber and glass wool have been used successfully.

Referring now to FIG. 3 of the drawings, which shows an alternative embodiment, the reinforcing elements in this instance take the form of a honeycomb A which is preferably formed of paper or the like with adjacent sections glued to each other. Instead of starting with a bat of insulating material as described with reference to FIG. 1, the honeycomb is simply filled with scrap or waste ma-

terials left over from the construction of elements of the type shown in FIG. 1. The plurality of glued sections of the honeycomb provide sufficient load bearing capability. This embodiment, therefore, effects a saving in the manufacture of insulating elements.

In FIG. 4 of the drawings, a further alternative embodiment is shown and it will be noted that this differs only very slightly from the embodiment of FIG. 1 and no detailed description is believed necessary in order to fully understand this figure.

FIG. 5 shows a further alternative embodiment in which the insulating bat is scored or cut in an X-shape at its center and then in an annular shape surrounding the center. A ring of corrugated cardboard may then be inserted in the circular cut and an X-shaped member of the type shown and described with reference to FIG. 1 is inserted in the center cut.

Turning now to FIG. 6 of the drawings, a still further alternative embodiment of the present invention is disclosed. Here, four reinforcing elements of equal length are fitted together in the form of a checkerboard having equal areas and therefore dividing the insulating bat into equal areas. Preferably, one of the reinforcing members is selected from the material useful for the center X-shaped member described with reference to FIG. 1.

It is believed that the usefulness of the structures described herein will be apparent to those skilled in the art. The insulating value is extremely high and tends to remain high because of the reinforcing elements which maintain the original geometrical configuration of the element. The insulating material is protected from the adverse effects of dirt, dust, moisture and the like by the heat-sealed, fluid impermeable outer covering. Due to the shape of the units, they are easily packed and transported and easily assembled in their ultimate useful positions at the construction site.

While specific materials and geometrical forms have been hereinbefore described, applicant is believed to be entitled to a full range of equivalents within the scope of the appended claim.

I claim:

A thermal insulating element for supporting a poured, settable slab, said element comprising: a bat of form sustaining thermal insulating material having a pair of substantially parallel, opposed, planar surfaces, said bat also having a plurality of apertures formed therein and extending between said surfaces, one of said apertures being centrally positioned in said bat; a load supporting and low heat insulating member of permanent load supporting character in said central aperture; a load supporting and higher heat insulating member of less permanent load supporting character in each of the remaining of said apertures, said load supporting members also extending between said opposed surfaces; a sheet member corresponding in size to said opposed surfaces and disposed in contact with one of said surfaces; and a closely fitting, fluid tight, outer covering for unitizing the assembly of said bat, said load supporting members and said sheet member, whereby the weight of the slab, when poured, is supported by all of said load supporting members and upon deterioration of the less permanent load supporting members, by said central load supporting member of permanent load supporting character.

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